

Christophe D'HULST

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Brief Professional Summary

↳ 2006-Present: Professor (tenure position) at the UST of Lille in Plant Glycobiology.

↳ 1997-2006: Associate Professor (tenure position) at the University of Sciences and Technology of Lille.

↳ Dec 2002: Habilitation à Diriger des Recherches (Habilitation) « The biosynthesis of the plant starch: from the selection of mutants to the understanding of the enzymatic mechanisms ». Composition of the committee: Pr Alison Smith (JIC, Norwich, UK), Pr Alan Myers (ISU, Ames, USA), Dr Alain Buléon (INRA of Nantes), Dr Jean Claude Michalski (CNRS, Lille, France), Pr Steven Ball (Director of research).

↳ Nov. 1994- Apr. 1997: PhD thesis at UST Lille (Supervisor: Pr. Steven Ball). The research work was achieved during a long term stay (almost 2 years from Jan. 1995 to Dec. 1996) at the Institut of Molecular Biology (Institut fuer Genbiologische Forschung GmbH, Ihnestraße 63, 14195 Berlin, Germany) in the group of Pr. Lothar Willmitzer* under the supervision of Dr Jens Kossmann**.

*Current address: Max-Planck-Institut für Molekulare Pflanzenphysiologie 14424 Potsdam, Germany.

**Current address: Institut of Plant Biotechnology (IPB). University of Stellenbosch, Private bag X1, Matieland, South Africa, 7602; kossmann@sun.ac.za

Title of thesis:

Soluble Starch synthase II: the enzyme responsible for the synthesis of the amylopectin crystals in *Chlamydomonas reinhardtii*. Defended on 04/11/1997 with « European Label » at UST Lille. Composition of the committee: Pr Richard Visser (Univ of Wageningen, NL), Pr Jean-Pierre Jacquot (IPB, Orsay France), Pr René Matagne (Univ of Liege, Belgium), Dr. Jens Kossmann (IGF, Berlin, Germany), Pr André Verbert (CNRS, Villeneuve d'Ascq, France), Pr Steven Ball (supervisor)

List of Publications

- (1) Fontaine T., D'Hulst C., Maddelein M-L., Routier F., Marianne-Pepin T., Decq A., Wierszeski J. M., Delrue B., van den Koornhuyse N., Bossu J-P., Fournet B., & Ball S.G. (1993). Toward an understanding of the biogenesis of the starch granule. Evidence that *Chlamydomonas* soluble starch starch synthase II controls the synthesis of intermediate size glucans of amylopectin. *J. Biol. Chem.*, **268**: 16223-16230.
- (2) Maddelein M-L., Libessart N., Bellanger F., Delrue B., D'Hulst C., Van Den Koornhuyse N., Fontaine T., Wierszeski J. M., Decq A. & Ball, S.G. (1994). Toward an understanding of the biogenesis of the starch granule: Determination of granule-Bound and soluble starch synthase functions in amylopectin synthesis. *J. Biol. Chem.*, **269**: 25150-25157.
- (3) Libessart N., Maddelein M-L., van den Koornhuyse N., Decq A., Delrue B., Mouille G., D'Hulst C. & Ball S.G. (1995). Storage, photosynthesis and growth: the conditional nature of mutations affecting starch synthesis and structure in *Chlamydomonas reinhardtii*. *Plant Cell*, **7**: 1117-1127.
- (4) Buléon A., Gallant D., Bouchet B., Mouille G., D'Hulst C., Kossmann J., & Ball S. (1997). Starches from A to C: *Chlamydomonas reinhardtii* as a model microbial system to

investigate the biosynthesis of the plant amylopectin crystal. *Plant Physiology*, **115**: 949-957.

- (5) van de Wal M., D'Hulst C., Vincken J-P., Buléon A., Visser R., & Ball S. (1998). Amylose is synthesized *in vitro* by extension of and cleavage from amylopectin. *J. Biol. Chem.*, **273**: 22232-22240.
- (6) Dauvillée D., Colléoni C., Shaw E., Mouille G., D'Hulst C., Morell M., Samuel M. S., Bouchet B., Gallant D. J., Sinskey A., & Ball, S. (1999). Novel starch-like polysaccharides are synthesized by a soluble form of granule-bound starch synthase in glycogen accumulating mutants of *Chlamydomonas reinhardtii*. *Plant Physiology*, **119**: 321-330.
- (7) Colléoni C., Dauvillée D., Mouille G., Buléon A., Gallant D., Bouchet B., Morell M., Samuel M., Delrue B., D'Hulst C., Bliard C., Nuzillard J-M., & Ball S. (1999). Genetic and biochemical evidence for the involvement of α -1,4 glucanotransferases in amylopectin synthesis. *Plant Physiology*, **120**: 993-1003.
- (8) Colléoni C., Dauvillée D., Mouille G., Morell M., Samuel M., Slomiany M-C., Liénard L., D'Hulst C., & Ball S. (1999). Biochemical characterization of the *Chlamydomonas* α -1,4 glucanotransferase supports a direct function in amylopectin biosynthesis. *Plant Physiology*, **120**: 1005-1014.
- (9) Dauvillée D., Mestre V., Colleoni C., Slomiany M., Mouille G., Delrue B., D'Hulst C., Bliard C., Nuzillard J., & Ball S. (2000). The debranching enzyme complex missing in glycogen accumulating mutants of *Chlamydomonas reinhardtii* displays an isoamylase-type specificity. *Plant Sci.* **157** (2): 145-156.
- (10) Zabawinski C., van den Koornhuyse N., D'Hulst C., Schlichting R., Giersch C., Delrue B., Lacroix J-M., Preiss J., & Ball S. (2001). Starchless mutant of *Chlamydomonas reinhardtii* lack the small subunit of a heterotetrameric ADP-Glucose pyrophosphorylase. *J. Bact.*, **183** (3): 1069-1077.
- (11) Dauvillée D., Colleoni C., Mouille G., Buléon A., Gallant D., Bouchet B., Morell M., D'Hulst C., Myers A., & Ball S. (2001). Two loci control phytoglycogen production in the unicellular green alga *Chlamydomonas reinhardtii*. *Plant Physiology*, **125**: 1710-1722.
- (12) Dauvillée D., Colléoni C., Mouille G., Morell M., D'Hulst C., Wattebled F., Liénard L., Delvallé D., Ral J-P., Myers A., & Ball S. (2001). Biochemical characterization of wild-type and mutant isoamylases of *Chlamydomonas reinhardtii* supports a direct function of the multimeric enzyme organization in amylopectin maturation. *Plant Physiology*, **125**: 1723-1731.
- (13) Hicks G., Hironaka C., Dauvillée D., Funke R., D'Hulst C., Waffenschmidt S., & Ball S. (2001). When simpler is better: unicellular green algae for discovering new genes and functions in carbohydrate metabolism. *Plant Physiology*, **127** (4): 1334-1338
- (14) Wattebled F., Buléon A., Bouchet B., Ral J-P., Liénard L., Delvallé D., Binderup K., Dauvillée D., Ball S., & D'Hulst C., (2002). Granule-bound starch synthase I. A major enzyme involved in the biogenesis of B-crystallites in starch granules. *Eur. J. Biochem.*, **269** (15): 3810-3820.
- (15) Wattebled F., Ral J-P., Dauvillée D., Myers A., James M., Schlichting R., Giersch C., Ball S., & D'Hulst C., (2003). STA11 a *Chlamydomonas* locus required for normal starch granule biogenesis encodes disproportionating enzyme: further evidence for a function of α -1,4 glucanotransferases during starch granule biosynthesis in green algae. *Plant Physiology*, **132** (1): 137-145.
- (16) Ball S., Liénard L., Wattebled F., Steup M., Hicks G., & D'Hulst C., (2003). Defining the functions of maltodextrin active enzymes in starch metabolism in the unicellular alga *Chlamydomonas reinhardtii*. *Journal of Applied Glycoscience*, **50**: 187-189.

- (17) Ral J.P., Derelle E., Ferraz C., Wattebled F., Farinas B., Corelou F., Buléon A., Stomianny MC., Delvallé D., D'Hulst C., Rombauts S., Moreau H., & Ball S. (2004). Starch division and partitioning: a mechanism for granule propagation and maintenance in the picophytoplanktonic green alga *Ostreococcus tauri*. *Plant Physiology*, 136 (2): 3333-3340.
- (18) Wattebled F., Dong Y., Dumez S., Delvallé D., Planchot V., Berbezzy P., Vyas D., Colonna P., Chatterjee M., Ball S., & D'Hulst C. (2005). Mutants of *Arabidopsis* lacking a chloroplastic isoamylase accumulate phytoplasmogen and an abnormal form of amylopectin. *Plant Physiology* 138 (1): 184-195.
- (19) Delvallé D., Dumez S., Wattebled F., Roldán I., Planchot V., Berbezzy P., Colonna P., Vyas D., Chatterjee M., Ball S., Mérida A., & D'Hulst C. (2005). Soluble starch synthase I: a major determinant for the synthesis of amylopectin in *Arabidopsis thaliana* leaves. *Plant Journal* 43: 398-412.
- (20) Deschamps P., Haferkamp I., Dauvillée D., Haebel S., Steup M., Buléon A., Putaux JL., D'Hulst C., Gould S., Maier U., Neuhaus E. & Ball S. (2006) The nature of the periplastidial pathway of amylose synthesis in the cryptophyte *Guillardia theta*. *Eukaryotic Cell* 5: 954-963.
- (21) Dauvillée D., Chochois V., Steup M., Haebel S., Eckermann N., Ritte G., Ral J-P., Colleoni C., Hicks G., Wattebled F., Deschamps P., D'Hulst C., Liénard L., Buléon A., Putaux J-L., & Ball S., (2006). Plastidial phosphorylase is required for normal starch granule biogenesis in the monocellular alga *Chlamydomonas reinhardtii*. *The Plant Journal*, 48: 274-285
- (22) Ral J-P., Colléoni C., Wattebled F., Dauvillée D., Nempong C., Deschamps P., Li Z., Morell M., Chibbar R., Purton S., D'Hulst C., & Ball S., (2006). Circadian clock regulation of starch metabolism establishes GBSSI as a major contributor to amylopectin synthesis in *Chlamydomonas reinhardtii*. *Plant Physiology*, 142 (1): 305-317
- (23) Dumez S., Wattebled F., Dauvillée D., Delvallé D., Planchot V., Ball S. G., & D'Hulst C., (2006). Mutants of *Arabidopsis* lacking starch branching enzyme II substitute plastidial starch synthesis by cytosolic maltose accumulation. *The Plant Cell*, 18: 2694-2709.
- (24) Roldán I., Wattebled F., Lucas M., Delvallé D., Planchot V., Ricardo Pérez S-J., Ball S. G., D'Hulst C., & Mérida A., (2007). The phenotype of Soluble Starch Synthase IV defective mutants of *Arabidopsis thaliana* suggests a novel function of elongation enzymes in the control of starch granule formation. *The Plant Journal*, 49 (3): 492-504.
- (25) Deschamps P., Colleoni C., Nakamura Y., Suzuki E., Putaux JL., Buléon A., Haebel S., Ritte G., Steup M., Falcón L. I., Moreira D., Loffelhardt W., Nirmal Raj J., Plancke C., D'Hulst C., Dauvillée D., Ball S. (2008). Metabolic symbiosis and the birth of the plant kingdom. *Molecular Biology and Evolution*, 25 (3): 536-548.
- (26) Plancke C., Colleoni C., Deschamps P., Dauvillée D., Nakamura Y., Haebel S., Ritte G., Steup M., Buléon A., Putaux J-L., Dupeyre D., D'Hulst C., Ral J-P., Löffelhardt W., Ball S.G., (2008). Pathway of cytosolic starch synthesis in the model glaucophyte *Cyanophora paradoxa*. *Eukaryotic Cell*, 7 (2): 247-257.
- (27) Deschamps P., Haferkamp I., D'Hulst C., Neuhaus E. & Ball SG., (2008). The relocation of starch metabolism to chloroplasts: when, why and how. *Trends in Plant Science*, In press.
- (28) Zhang X., Szydlowski N., Delvallé D., D'Hulst C., James M. G., & Myers A. M., Analysis of the related roles of starch synthase II and starch synthase III in amylopectin biosynthesis in *Arabidopsis* leaves. *BMC Plant Biology* 2008, 8:96 (23 September 2008)
- (29) Wattebled F., Planchot V., Dong Y., Szydlowski N., Pontoiré B., Devin A., Ball S., & D'Hulst C., (2008). Further Evidence for the Mandatory Nature of Polysaccharide Debranching for the Aggregation of Semi-Crystalline Starch and for Overlapping Functions of Debranching Enzymes in *Arabidopsis* Leaves. *Plant Physiology*, Published on September 24, 2008; 10.1104/pp.108.129379.

Chapter

↳ Morell M. K., Li Z., Regina A., Rahman S., D'Hulst C., & Ball S. G. (2006). Control of starch biosynthesis in vascular plants and algae. In *Control of primary metabolism in plants*, Annual Plant reviews series, Plaxton W. and McManus M. Eds, Blackwell publishing.

Oral communications as invited speaker

↳ C. D'Hulst (2005). The function of soluble starch synthases for the synthesis of amylopectin in *Arabidopsis* leaves. *Biosynthesis and degradation of reserve carbohydrates in plants. 3ème cycle Romand en Sciences Biologiques*, September 1-2, Bern, Switzerland

↳ C. D'Hulst (2005). The function of soluble starch synthases for the synthesis of amylopectin in *Arabidopsis* leaves. *Starch Round Table*, September 8-10 Orlando, Florida USA.

↳ C. D'Hulst (2009). The function of soluble starch synthases for the synthesis of amylopectin in *Arabidopsis* leaves. *Starch Round Table*, September 10-12 Baltimore, MD, USA.

Other oral communications

↳ C. D'Hulst, A. Buléon, G. Abel, Gallant D., J. Kossmann and S. Ball (1997). Soluble Starch-Synthase II Activity is Required for the Building of the Amylopectin Crystal in *Chlamydomonas reinhardtii*. *Plant Biology '97, ASPP Annual Meeting*, Hotel Vancouver and Hyatt Regency, Vancouver, BC, Canada, August 2 - August 6, 1997

↳ C. D'Hulst, G. Abel, K. Madagan, F. Wattebled, J-P. Ral, S. Purton, J. Kossmann & S. Ball, (1999). Are four starch-synthases involved in starch biosynthesis in the green alga *Chlamydomonas reinhardtii*? *Genetic tailoring of novel starch polymers*, Dissemination of results obtained during the 1996-1999 EU funded FAIR Program CT95-0568. Carry-le-Rouet, France 16-20 september 1999

↳ C. D'Hulst, F. Wattebled, J-P. Ral, S. Ball, (2000). Starch biosynthesis in the green alga *Chlamydomonas reinhardtii*: soluble and granule bound starch synthases. *Plant Biotechnology Institut of NRC-CNRC Saskatoon (Canada)*, January 2000.

↳ C. D'Hulst (2006). Genomics approach for the study of starch metabolism in the *Arabidopsis* leaves: example of the starch-synthases and branching enzymes. *Invitation of the Institut de Biotechnologie des Plantes, UMR8618 du CNRS, Orsay*, on 01/13/2006

↳ C. D'Hulst (2007). Mechanisms underlying the initiation of starch synthesis in plants. *Invitation of the Laboratoire Plastes et Différentiation Cellulaire UMR 5575 du CNRS, Université Joseph Fourier, Grenoble*, on 01/11/2007

↳ C. D'Hulst (2008).The mechanisms underlying starch granule priming in plants: The function of Soluble Starch Synthase 4 and the control by the plastid division machinery. *Institut für Biochemie und Biologie der Universität Potsdam, Golm, Germany*, Invited by Pr. Martin STEUP on March 4th 2008

Patents

↳ **S. Ball and C. D'Hulst.** Grains d'amidon contenant un polypeptide recombinant d'intérêt, leur procédé d'obtention, et leurs utilisations. French patent; Priority application (may 21 1999), n° 99 06494 ; International patent n° PCT/FR00/01384 (May 19th 2000).

↳ **C. D'Hulst, M. Chatterjee, V. Planchot.** Procédé d'amélioration des plantes. French patent by Génoplante-Valor. Priority application 03/29/2004 n° 04 03242.

↳ **C. D'Hulst, Angel Mérida, V. Planchot,** Plants defective for soluble starch synthase IV (SSIV) activity, methods for obtaining the same, and uses thereof. European patent by INRA. Priority application: 07/28/2006 n°06118112.9

Long and short term stays in a foreign country

↳ **Jan. 1995 to Dec. 1996 (23 months):** Institut fuer Genbiologische Forschung GmbH, Pr. L. Willmitzer, Ihnestrasse 63, 14195 Berlin Germany.

↳ **Jan. 1999 (4 weeks):** Photosynthesis Research Group, Dr Saul Purton Department of Biology, University College London, Gower Street, London WC1E 6BT, United Kingdom.

↳ **July 1999 (2 weeks):** Photosynthesis Research Group, Dr Saul Purton Department of Biology, University College London, Gower Street, London WC1E 6BT, United Kingdom.

↳ **Oct 1999 – Feb. 2000 (3 months):** Dr Ravindra Chibbar, Plant Biotechnology Institute National Research Council Canada in Saskatoon (Saskatchewan) 110, Gymnasium Place, Saskatoon (SK) S7N 0W9, Canada.

↳ **Jan. 2000 (2 weeks):** Pr Alan Myers, Department of Biochemistry Biophysics and Molecular Biology at Iowa State University. AMES, IA 50011, USA.

↳ **Apr. - May 2001 (1 month):** Dr Glenn Hicks Department of Plant Biology at Exelixis Inc, South San Francisco, CA 94080, USA

International collaborations

↳ **Sept 2005-Dec 2005 (3 months):** Reception of Isaac Roldan, a spanish graduate student from Instituto de Bioquímica Vegetal y Fotosíntesis of the University of Seville (CSIC) with EMBO Short Term Fellowship.

↳ **2006-2007:** Program “Programme Hubert Curien Picasso” of Egide n° 11488UE in collaboration with the group of Dr Angel Mérida of IBFV (CSIC) at the University of Seville. Research topic: « Functional study of soluble starch synthases during the synthesis of amylopectin in *Arabidopsis thaliana* ».

↳ **June-July 2008 (1 month):** Reception of Paula Ragel, a Spanish graduate student from Instituto de Bioquímica Vegetal y Fotosíntesis of the University of Seville (CSIC) with bilateral Programme Hubert Curien “Picasso” of Egide

Others

Expert for several international journals: *The Plant cell*, *The Plant Journal*, *Plant Physiology*, *BMC Plant Biology*, *Plant, Molecular Biology*, *Phytochemistry*, *Plant Science*, *Journal of Plant Physiology*

Scientific coordination of externally funded research programs

1) Contrat Plan Etat Région for the period 2000-2006. Title: « Genetics dissection of starch metabolism: from green chemistry to phyto-therapeutics uses. This research program was funded by the Région Nord Pas de Calais, the European Union and the French ministry of research. Consumable + travel costs: 62512 €; Equipment: 66979 €; Salary for graduate student: 21700 €

2) Program “Génoplante phase II” for the period 2004-2007 n°Af2001030 « Functional genomics approach for the study of starch biosynthesis in *Arabidopsis thaliana* ». Partners of the project: Biogemma, UK (Cambridge) and URPOI (INRA de Nantes). Overall cost of the project: 343600 € of which 188 000 € for

UMR8576 distributed as follow: Consumable + Travel costs: 108850 €; Durable equipment: 15150 €; Salary for a 2 years Research Technician: 64000€.

3) Action de Recherche Concertée d'initiative régionale « Projets en Emergence » (emerging projects). Project Funded by the Région Nord Pas de Calais, the European Union and the French Ministry of research. Title: « Functional genomics approach for the study of the mechanisms underlying starch synthesis and degradation and their regulation in *Arabidopsis thaliana* ». Overall cost: 142600 € distributed as follow: Consumables + travel costs: 46700 €; Durable equipment: 22600 €; Salary of a 2 years postdoc: 73300 €.

4) Action Concertée Incitative « Jeunes-Chercheurs » of the French ministry of research for the period 2005-2007. Title « Functional genomics approach for the study of the regulation of storage polysaccharides synthesis and degradation in *Arabidopsis thaliana* » Project n° JC5145. Consumables + Travel costs: 75000 €.

5) Action Concertée Incitative « Biologie Cellulaire Moléculaire et Structurale » (n° BCMS115) for the period 2005-2007. Title: « From molecular biology to structural biology: development of biomimetic systems to understand the mechanisms of synthesis of the starch granule ». Collaborating partners: CERMAV in Grenoble (Jean-Luc Putaux), INRA of Nantes: (A. Buléon, P. Colonna and V. Planchot. Overall cost: 60 000 € of which 21700 € for UMR8576 for Consumables + Travel costs)

6) Agence Nationale de la Recherche “Génoplante 2010”. Project n° GPLA 06011G: “ISD-starch: Initiation Synthesis and Degradation: an integrated approach toward the understanding of starch metabolism and formation in plants”. Partners: INRA of Nantes (department BIA) and INRA of Evry (department URGV). Overall cost of the project: 298986€ of which 146144 € for UMR8576 distributed as follow: consumables + Travel costs: 69791€; Durable equipment: 17205€; Salary for 18 months postdoc: 59148€.

In total, I was able to mobilize up to 724635€ for the period 2000-2007 in competitive national “Call for Proposal”. The funds obtained during this period were distributed as follow:

Consumables + travel costs: 384553€

Durable equipment: 121934€

Salary: 218148€

Supervision of graduate students

1997-1998: Master student: Fabrice WATTEBLEED. Research project: «Characterization of genes conditioning the enzymes of elongation of the α - glucanes in the green unicellular alga *Chlamydomonas reinhardtii*». UST of Lille.

1998-1999: Master student: Jean-Philippe RAL. Research project: «Production of a specific immunizing response against proteins associated with the starch grain by direct injection of native starch granules in rabbit». UST of Lille.

2000-2001: Master student: David DELVALLE. Research project: «Functional analysis of the *Chlamydomonas reinhardtii*'s GBSS1: towards the comprehension of the synthesis of amylose within the starch granule». UST of Lille.

1998-2002: PhD student: Fabrice WATTEBLEED. Thesis title: «Contribution to the understanding of the metabolism of starch metabolism and its regulation in *Chlamydomonas reinhardtii*». Thesis was defended on December 13th, 2002 at UST of Lille.

1999-2003: PhD student: Luc LIENARD Thesis title: «Analysis of a mutant of *Chlamydomonas reinhardtii* defective for one form of plastidial starch-phosphorylase». Thesis was defended on June 26th 2003 at UST of Lille.

2000–2004: PhD student: Jean-Philippe RAL Thesis title: «Molecular and enzymological characterizations of the soluble starch-synthases and the branching enzymes of the green alga unicellular *C. reinhardtii*». Thesis was defended on June 4th 2004 at UST of Lille.

Thesis and Master Students relevant to the current research project of the group of Plant Glycobiology:

2001–2005: PhD student: David DELVALLE Thesis title: «Functional analysis of three soluble starch-synthases isoforms of the leaves of *Arabidopsis thaliana*». Thesis defended on Sept. 27th 2005 at UST of Lille.

2001-2002: Master student: Sylvain DUMEZ. Research project: «Biochemical and molecular studies of *Chlamydomonas reinhardtii* strains presenting a particular phenotype of the starch biosynthesis». UST of Lille

2002 - 2006: PhD student: Sylvain DUMEZ. Thesis title: «Functional analysis of starch branching enzymes in the *Arabidopsis thaliana* leaves». Thesis was defended on May 12th 2006 at UST of Lille.

2002-2003: Master student: Ying DONG Research project: «Determination of the implication of the debranching enzymes of the *Arabidopsis thaliana* leaves in the process of amylopectin synthesis». UST of Lille

2003-2007: PhD student Ying DONG Research project: «Functional study of starch debranching enzymes of the *Arabidopsis* leaves: between synthesis and degradation, determination of the functions of the different isoforms of isoamylases and pullulanase». Thesis was defended on June 22nd 2007 at UST of Lille

2003-2004: Master student: Margarita VASSILEVA. Research project: «Study of *Arabidopsis* mutants defective for enzymes of the amylases family and the glucanotransferases». UST of Lille

2004-2005: Master student: Olivier GUAIS. Research project: «Starch metabolism in *Arabidopsis* leaves: contribution to the study of the functional interactions between genetically independent enzymatic isoforms». UST of Lille

2005-now: PhD student: Nicolas SZYDLOWSKI. Research project: «Study of the functions of the soluble starch-synthases for the initiation of the synthesis of amylopectin in *Arabidopsis thaliana*». Thesis to be defended by the end of 2008 at UST of Lille

2006-2007: Master student: Elise DOUVILLE. Research project: «Role of the soluble starch-synthase IV during the initiation of starch synthesis in *Arabidopsis thaliana*».

2006 to now: PhD student: Aline DEVIN. Research project: «Determination of the implication of α and β -amylases and the α -glucan-phosphorylases during the degradation of the starch in the leaves of *Arabidopsis thaliana*»

2007 to now: Master student: Aurélie DELANNOY. Research project: Genetic dissection of the control of plastid division and starch granule priming in *Arabidopsis thaliana*.

Teaching activities

I have been involved in several teaching duties since I have been recruited at the University of Sciences & Technologies of Lille in Sept 1997. Below, I have listed teaching duties in which I have been mostly involved during the last 5 years. I was essentially involved in the teaching of Genetics, molecular biology and microbiology. Indeed, at the beginning of my career, I was recruited in a research group involved in the study of starch

metabolism in the unicellular green alga *Chlamydomonas reinhardtii*. Therefore, this group was mainly engaged in the teaching of eukaryotic microbiology and in corresponding genetics. In "Other teaching activities" I have summarized teaching duties in which I have been involved in the past.

Title of course: Mendelian and molecular genetics

Level: Licence, 2nd year

Lecture for a total of 35h that describes the theory and main principles of Mendelian and molecular genetics.

Contents: mono- and poly-hybridism, definition of phenotype, genotype, allele, dominance/recessivity, codominance, pedigree analysis, epistasis, pleiotropy, lethality, penetrance and expressivity, chromosomal theory of heredity, sex-linked genes and heredity, sex determination, meiosis, inter- and intra- chromosomal recombination, frequency of recombination and genetic distance between genes, Chi-square test, tetrad analysis (linear and non-linear tetrads), Origins of the allelic diversity (modification of the number of chromosomes and modification of the morphology of chromosomes: inversions, translocations, deletions; gene mutations and mutagen agents; mobile elements and their impact on gene expression; Structure and function of genes: example of phenylketonuria). Presentation of the structures of both the DNA and the RNA. Introduction to replication, transcription and translation. Notions of gene manipulation. Introduction to restriction enzymes, PCR, cloning methods.

Classes for 15h in Mendelian and molecular genetics

Contents: exercises, illustrative examples of theory presented during lecture.

Title of course: Microbiology 1 (class of virology)

Level: Licence 2nd year

Classes for 9h

Definitions, structures of viruses (capside, other proteins, nucleic acids); Methods for the study of viruses; Techniques of titration. Multiplication strategies of bacteriophages: λ , MS2, M13. Multiplication strategies of retroviruses.

Title of course: Biochemical genetics: example of the glycosyltransferases

Level: Master 1, 4th year

Lecture for 10h

This course explores the different functional genomics approaches available in plants with an emphasis on maize (Gene Machine) and *Arabidopsis thaliana*. The principles of functional genomics are exposed and their applications to plants are described. Concrete examples are given by the analysis of research work carried out in maize and *Arabidopsis thaliana* regarding the study of starch glycosyltransferases.

Title of course: Practical work in plant functional genomics

Level: Master 1, 4th year

Practical work for 100h

The objective of this course is to allow the students to develop a research project dedicated to the study of starch metabolism in the model microorganism *Chlamydomonas reinhardtii*. Insertion mutants are produced by plasmid transformation of the alga. After selection, these mutants are analyzed for their capacities to accumulate and/or to degrade starch by the iodine staining of several thousands of clones directly on Petri dishes. Clones that display interesting phenotypes are further analyzed to define the origin of the phenotype. Finally, students expose their results and strategy in the form of a poster that they defend in front of a panel of faculty members.

Other teaching activities

Title of course: Genetics of Unicellular Eukaryotes and Virology

Level: Licence, 3rd year

Practical work for 20h

The objective of this series of practical works was to study the killer system in *Saccharomyces cerevisiae* (the killer character is dependent on a cytoplasmic dsRNA which expression is tightly controlled by several nuclear genes). Students are trained for the manipulation of microorganisms in sterile environment. At the beginning of the practical work, each student receives one strain of yeast. Their objective is to determine sexual polarity and auxotrophy. The killer trait is studied at the haploid and diploid levels and in cytotoxicant. RNA extraction is performed to visualize the different entities involved in this character.

Course title: Introduction to Biochemistry and Molecular Biology

Level: 3rd year of school of engineer (Ecole Nationale Supérieure de Chimie de Lille)

Lecture for 25h

Introduction to the biochemistry (structures and metabolism) of the four main types of biological molecules: carbohydrates, lipids, proteins, and nucleic acids. Introduction to enzymology and to cellular mechanisms of production of energy (photosynthesis, tricarboxylic acids cycle). Finally, an introduction is given to molecular biology, the transmission of the hereditary material and to gene manipulation (restriction enzymes, cloning, DNA and RNA analysis etc).